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Mr. William F. Caton
Acting Secretary
Federal Communications Commission
1919 M Street, N.W. Room 222
Washington, DC 20554

RE: ET Docket No. 95-18
RM-7927

Dear Mr. Caton:

Transmitted herewith for filing with the Commission on behalf of Loral/QUALCOMM Partnership, L.P., are an original and four copies of its "Reply Comments" in the above-referenced docket.

Should there be any questions regarding this matter, please communicate with this office.

Respectfully submitted,



William D. Wallace

Enclosure

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JUN 21 1995

FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

In the Matter of)
)
Amendment of Section 2.106)
of the Commission's Rules)
to Allocate Spectrum at 2 GHz for)
Use by the Mobile-Satellite Service)
_____)

ET Docket No. 95-18
RM-7927

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REPLY COMMENTS

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June 21, 1995

SUMMARY

Based on the initial comments in this proceeding, the Commission should continue to pursue a domestic allocation for the Mobile-Satellite Service (MSS) at 2 GHz of at least 70 MHz. Studies indicating that MSS would need from 150-300 MHz of spectrum were noted in the comments, and no party suggested that MSS would need less than 70 MHz of spectrum. The concerns of those few parties which opposed the allocation can be addressed by the recommendation of several other parties not to relocate terrestrial fixed service (FS) microwave stations in the 2165-2200 MHz band, but rather, to permit FS users and MSS licensees to share this segment.

Although there was general support for the proposed domestic allocation, the Commission should defer a final decision on the U.S. allocation until after the 1995 World Radiocommunication Conference (WRC-95) has considered a revision to the international allocation for MSS at 2 GHz. As commenters pointed out, there are proposals to modify the international allocation at WRC-95, and until the results of the conference are known, it is futile to adopt a domestic allocation for potential assignment to global MSS systems licensed by the United States.

The comments also demonstrated that the Commission's proposed transition plan from existing 2 GHz uses to MSS is not feasible because of the enormous costs which would be imposed upon MSS licensees. Several commenters pointed out that relocation of existing users may not be necessary. FS and MSS users may be able to share the proposed MSS downlink band at 2165-2200 MHz, and it

may be possible to retune broadcast auxiliary service (BAS) equipment so as not to require replacement of spectrum for BAS stations currently operating in the proposed MSS uplink band at 1990-2025 MHz. These and other alternative proposals set forth in the comments provide a potential resolution of the competing interests of the MSS, BAS and FS industries, and should be reviewed and analyzed in the context of a Federal Advisory Committee.

With respect to rules for 2 GHz MSS, the Commission should consider service and technical rules for 2 GHz MSS only after the allocation and transition issues have been resolved. The commenting parties offered a variety of views on rules for orbital height, access technology, geographic coverage, power limits and feeder link allocations. These proposals should generally be considered in the context of actual applications for use of the 2 GHz MSS allocation. The Commission should firmly reject CELSAT's suggestion to restrict eligibility of applicants for 2 GHz MSS to companies which do not hold MSS licenses.

The proposal to award MSS licenses by competitive bidding was universally opposed. The commenters pointed to both statutory and policy reasons why the Commission should first accept applications for 2 GHz MSS and attempt to find an engineering solution for any mutual exclusivity which may exist among such applications. Only if such a solution is not available should the Commission consider whether to award licenses by competitive bidding.

TABLE OF CONTENTS

	<u>Page</u>
I. THE COMMENTING PARTIES GENERALLY AGREE THAT 70 MHZ IS THE MINIMUM ALLOCATION NECESSARY FOR MSS AT 2 GHZ	2
II. THE COMMISSION SHOULD DEFER FINAL ACTION ON THE 2 GHZ MSS ALLOCATION UNTIL AFTER WRC-95	4
III. THE PROPOSED TRANSITION PLAN FOR THE MSS ALLOCATION AT 2 GHZ SHOULD BE REFERRED FOR CONSIDERATION BY A FEDERAL ADVISORY COMMITTEE	5
A. Relocation May Not Be Necessary	6
B. The Costs of Relocation As Proposed Would Be Prohibitive	9
C. If a Relocation Plan Is Adopted for BAS and FS Stations, a Federal Advisory Committee Would Be Needed to Develop Principles for Cost Sharing and Apportionment	12
IV. THE COMMENTS PROVIDE NO JUSTIFICATION FOR ADOPTING SERVICE AND TECHNICAL RULES FOR 2 GHZ MSS AT THIS TIME	14
A. Geostationary vs. Non-Geostationary Orbit	14
B. Access Technology	16
C. Geographic Coverage	18
D. Power Limits	19
E. Feeder Links	19

V.	THE COMMISSION SHOULD REJECT CELSAT'S PROPOSAL TO RESTRICT APPLICATIONS FOR 2 GHZ MSS TO NON-LICENSEES	20
VI.	THE COMMENTS PROVIDE NO SUPPORT FOR THE COMMISSION'S INITIAL PLANS TO AWARD 2 GHZ MSS LICENSES BY AUCTION	23
VII.	CONCLUSION	28

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Use by the Mobile-Satellite Service)
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To: The Commission

REPLY COMMENTS

Pursuant to Section 1.415 of the Commission's Rules, Loral/QUALCOMM Partnership, L.P. (LQP), hereby submits its Reply Comments in this proceeding. See Notice of Proposed Rule Making, FCC 95-39 (released Jan. 31, 1995) (NPRM).

Although the proposed allocation for Mobile-Satellite Service (MSS) at 2 GHz received general support in the initial comments, many parties agreed with LQP's assessment that complex issues remain to be resolved before an allocation can be implemented. In light of the initial comments, LQP strongly recommends the following actions:

(1) The Commission should continue to pursue a domestic allocation for MSS at 2 GHz of at least 70 MHz but should defer a final decision on the U.S. allocation until after the 1995 World Radiocommunication Conference (WRC-95) has considered a revision to the international MSS allocation at 2 GHz.

(2) The proposed transition plan from existing 2 GHz uses to MSS should be reviewed and analyzed by a Federal Advisory Committee, and a Further NPRM

should be issued after the committee has reported to the Commission.

(3) With respect to system parameters, the Commission should consider service and technical rules for 2 GHz MSS only after the allocation and transition issues have been resolved;

(4) The Commission should accept applications for 2 GHz MSS after the U.S. allocation has been adopted and should attempt to find an engineering solution for any mutual exclusivity which may exist before deciding whether to award licenses by competitive bidding.

I. THE COMMENTING PARTIES GENERALLY AGREE THAT 70 MHZ IS THE MINIMUM ALLOCATION NECESSARY FOR MSS AT 2 GHZ.

In its initial comments, LQP pointed out that recent studies of the spectrum requirements for MSS demonstrate that an allocation of approximately 150 to 300 MHz will be necessary to support the projected demand for MSS services, including both handheld and non-handheld services.¹ Motorola also recognized these studies and the need for this amount of MSS spectrum.² No party suggested that MSS would need less than a 70 MHz allocation. Accordingly, the record in this proceeding supports an allocation of at least 70 MHz.

Only two parties objected to the proposal to allocate 70 MHz at 1990-2025 MHz and 2165-2200 MHz to MSS. Southwestern Bell Mobile Services (SBMS)

¹ See LQP Comments, at 4-6.

² See Motorola Comments, at 6-9.

recommended that the Commission allocate only the 40 MHz at 1990-2010/2180-2200 MHz based on its concerns regarding its licensed facilities in the 2150-2180 MHz band.³ SBMS stated that it does not want to relocate its fixed service (FS) facilities to the 6 GHz band because replacement facilities may require multiple paths where one is now in use and larger antennas which existing towers may not accommodate.⁴ In addition, the Association of Public Safety Communications Officials International (APCO) opposed the allocation based on its opposition to any relocation of FS stations in the 2 GHz band.⁵

The concerns of SBMS and APCO do not preclude the adoption of the MSS allocation at 1990-2025/2165-2200 MHz. Many commenters in this proceeding have pointed out that it is feasible for MSS to share the 2165-2200 MHz band with existing FS microwave facilities.⁶ LQP has recommended that the sharing scenario be studied in detail within the context of a Federal Advisory Committee with the goal of avoiding migration of existing FS stations and eliminating the need for MSS systems to pay for relocation.⁷ Such additional study would likely resolve the concerns of SBMS and APCO regarding relocation of FS facilities if the Commission adopts the proposed 70 MHz allocation. Given the recognized need

³ SBMS Comments, at 1.

⁴ Id. at 2-3.

⁵ APCO Comments, at 2.

⁶ See, e.g., COMSAT Comments, at 18; TRW Comments, at 8; Celsat Comments, at 9.

⁷ LQP Comments, at 12-14, 16.

for MSS allocations and the potential for sharing between MSS and FS, the Commission should continue to pursue the 70 MHz allocation proposed in the NPRM.

II. THE COMMISSION SHOULD DEFER FINAL ACTION ON THE 2 GHZ MSS ALLOCATION UNTIL AFTER WRC-95.

As LQP has noted, the international allocation for MSS at 2 GHz will have a substantial impact on U.S. decisions regarding the domestic allocation and the service and technical rules for MSS systems operating at 2 GHz.⁸ Concurrently with this proceeding, the Commission is pursuing a modification to the international allocation for MSS at 2 GHz to be considered at WRC-95.⁹ It would be futile to adopt U.S. rules for global MSS systems prior to knowing what 2 GHz bands will be available internationally for this service. Both broadcast and satellite interests agreed with LQP that final action on the proposed allocation should be taken after WRC-95.¹⁰

In addition to the uncertainty of whether the Commission's 70 MHz proposal would be adopted at WRC-95, Constellation pointed out that the Commission's proposals in this proceeding are not even consistent with its proposals for the MSS allocation at 2 GHz for WRC-95:

⁸ See LQP Comments, at 7-8.

⁹ See Report in IC Docket No. 94-31, FCC 95-256 (released June 15, 1995).

¹⁰ See COMSAT Comments, at 7-8; Constellation Comments, at 2; Maximum Service Television Comments, at 7.

In this proceeding, the Commission [is] proposing to allocate 35 MHz of spectrum to MSS in each direction of transmission. However, the Commission is also proposing to allocate 40 MHz of MSS spectrum in each direction on a worldwide basis in its preparation for the 1995 [WRC]. The additional 5 MHz of MSS spectrum being proposed to WRC-95 will significantly affect any United States MSS satellite design even if the band could not be used in this country.¹¹

Constellation has correctly recognized that satellite system operators need to know what frequencies are available prior to preparation of applications. Accordingly, in order to avoid confusion in the licensing process, the Commission should defer action on the domestic allocation for MSS at 2 GHz until after WRC-95. At that time, the Commission should issue a Further NPRM to elicit comments on the allocation.

III. THE PROPOSED TRANSITION PLAN FOR THE MSS ALLOCATION AT 2 GHZ SHOULD BE REFERRED FOR CONSIDERATION BY A FEDERAL ADVISORY COMMITTEE.

The commenting parties pointed out that there are serious flaws in the Commission's proposal to relocate existing broadcast auxiliary service (BAS) and fixed microwave service (FS) stations from the proposed MSS allocation to other frequency bands. While many BAS and FS parties demanded equivalent spectrum and no-cost relocation,¹² the satellite industry demonstrated in detail the problems with this approach and set forth several potential solutions to meet all parties'

¹¹ Constellation Comments, at 2 (footnotes omitted).

¹² See, e.g., MST Comments, at 7-8; Society of Broadcast Engineers Comments, at 7-8; AAR Comments, at 2-5; UTC Comments, at 2-3.

interests. This record confirms LQP's recommendation that the Commission convene a Federal Advisory Committee to study issues related to the transition from BAS and FS to MSS in the proposed MSS allocation.¹³

A. Relocation May Not Be Necessary.

LQP pointed out in its initial comments that further study of alternatives to relocation was needed before adoption of the Commission's proposal to migrate BAS and FS microwave stations.¹⁴ LQP noted that its studies of sharing with terrestrial fixed stations suggested that it may not be necessary to relocate the FS stations in the 2165-2200 MHz band. Moreover, retuning BAS stations to use the remaining 85 MHz in the broadcast auxiliary band appeared to offer an alternative to migration for BAS.

Comments from both the satellite and broadcast industries supported these points. For example, COMSAT provided the results of a computer simulation which demonstrated that "MSS can share downlink spectrum at 2160-2200 MHz with FS operations in the United States without harming the quality of the existing FS services operating in the 2 GHz. band."¹⁵ COMSAT concluded that it would not be necessary to relocate FS stations in the 2110-2150/2160-2200 MHz bands as proposed in the NPRM. Similarly, CELSAT claimed that it could

¹³ See LQP Comments, at 12-14.

¹⁴ Id. at 14-16.

¹⁵ COMSAT Comments, at 18; see also COMSAT Comments, App. 2.

operate its proposed MSS system and share with FS stations.¹⁶ Constellation supported undertaking further studies of the sharing scenarios before requiring relocation.¹⁷

With respect to BAS, several parties suggested that BAS equipment should be retuned so that each channel would operate with a smaller bandwidth.¹⁸ For example, COMSAT suggested that the 85 MHz remaining in the BAS band could be rechannelized for one 13 MHz and six 12 MHz channels. Those parties suggesting a rechannelization approach included the Society of Broadcast Engineers (SBE). SBE proposed that retuning BAS equipment to operate at a smaller bandwidth (15 MHz) may be feasible, acceptable to broadcasters if replacement equipment is provided, and significantly less expensive than the Commission's relocation plan.¹⁹ While there was no agreement on a specific bandwidth, these comments suggest that retuning BAS equipment may be an alternative to relocation of BAS.

Whether or not these alternatives to relocation of BAS and FS are ultimately workable, the comments demonstrate that the Commission should put its relocation plan on hold. First, there are many unresolved questions regarding the need for the plan. Substantial research has been performed on the issue of

¹⁶ CELSAT Comments, at 9.

¹⁷ Constellation Comments, at 3.

¹⁸ See COMSAT Comments, at 22; TRW Comments, at 11-12.

¹⁹ SBE Comments, at 8.

sharing between MSS and FS stations in this and other contexts which suggests that an MSS-FS sharing approach is feasible.²⁰ The Commission should give the MSS and terrestrial microwave industries an opportunity to study sharing in the context of 2 GHz before it forces FS stations to relocate into higher frequencies and MSS applicants to divide an estimated \$2.5 billion in costs for FS relocation.²¹ Moreover, it appears that there may be viable alternatives to relocation of BAS, such as retuning BAS equipment, which would eliminate the need for migration of BAS. However, further study is necessary to determine what bandwidth is feasible and what impact the use of a narrower bandwidth would have on the reported congestion in ENG uses.²²

Second, commenters have suggested several alternatives to relocation, which, although inconsistent now, could form the basis for a compromise acceptable to the FS, broadcast and satellite interests. Based on the record, the Commission should realize that its proposal to mandate relocation was premature, and that further study of alternatives to relocation is warranted. As LQP suggested in its initial comments, a Federal Advisory Committee should be convened to conduct studies of alternatives and implementation of any transition plan from BAS and FS to MSS in the proposed 2 GHz allocation. This step would provide the best opportunity for the Commission to develop a solution which meets

²⁰ See COMSAT Comments, at App. 2; Report of the MSS Above 1 GHz Negotiated Rulemaking Committee, at § 3.4.4 (April 6, 1993).

²¹ See infra § III.B.

²² See MST Comments, at 10-15; SBE Comments, at 2-4.

the needs of broadcasters, FS microwave users, the satellite industry, and the public.

B. The Costs of Relocation As Proposed Would Be Prohibitive.

Without discussing the level of costs involved, the Commission proposed to relocate the first two channels of the BAS 2 GHz frequencies from 1990-2025 MHz to 2110-2145 MHz and to relocate the FS stations using the 2110-2145/2165-2200 paired frequencies to the existing emerging technology bands. Under the Commission's proposal, all costs of these two relocations would be borne by MSS operators in the 2 GHz allocation.

The record demonstrates that this proposal is unworkable and unjustified because it would impose huge costs on the satellite industry. Several parties provided estimates that to migrate the FS stations would alone cost \$2.5 billion.²³ This figure is based on an estimate of \$250,000 in relocation costs for a single microwave station with paired frequencies and the existence of over 10,000 such stations in the 2110-2145 MHz and 2165-2200 MHz bands.²⁴ To provide some gauge for the enormity of this estimate, COMSAT pointed out that the total costs

²³ See COMSAT Comments, at 11-12; PCSAT Comments, at 7; TRW Comments, at 10. These costs are based on information which has been exchanged in the ongoing meetings of the Ad Hoc Sub-Working Group of Informal Working Group 3 of the Industry Advisory Committee, considering the transition plan for 2 GHz.

²⁴ See COMSAT Comments, at 11-12.

for the planned ICO-P MSS system are \$2.6 billion.²⁵

With respect to BAS, Motorola commissioned a study which indicates that the costs to relocate the stations using the 1990-2025 MHz band would be over \$90 million.²⁶ On the other hand, COMSAT estimated that the costs of relocating and retuning BAS stations would be \$275 million.²⁷ While the estimates for relocating and retuning BAS stations are smaller than the estimates for relocating FS stations, the two estimates must be aggregated because, under the Commission's plan, incurring the \$90-275 million in costs to relocate BAS requires incurring the \$2.5 billion in costs to relocate FS. Cf. NPRM, ¶ 10.

Moreover, as PCSAT pointed out, the relocation costs must also be considered in light of the large system costs for 2 GHz MSS.²⁸ PCSAT estimates that its 2 GHz system would cost about \$885 million. COMSAT estimates the costs of INMARSAT's proposed ICO-P system at \$2.6 billion. When such costs are added to the costs of the transition plan, PCSAT correctly states that: "The combined cost of relocation and construction would significantly impede the development of MSS in the United States."²⁹

²⁵ Id.

²⁶ Motorola Comments, at 21.

²⁷ COMSAT Comments, at 13.

²⁸ PCSAT Comments, at 8-9.

²⁹ Id. at 9.

Even if the BAS and FS systems were migrated as proposed, and systems were constructed, the resulting costs to subscribers would far outstrip those proposed for handheld MSS. Significantly greater subscriber fees would probably result in the demise of MSS as currently envisioned. COMSAT explained why this scenario is likely to occur if the Commission's relocation plan is used:

This combined expense will likely have a substantial impact on service costs. Most of the planned global MSS systems contemplate offering service to end-users at between \$1.00 and \$2.00 per minute. If relocation costs, just to access the U.S. market, are pushed above \$3.0 billion and the combined costs of relocation and building the system exceed the \$5.0 billion mark, the service price per minute would have to rise appreciably. We believe that service prices beyond the \$2.00-\$3.00 per minute level would result in a dramatic drop-off of customers in the mass market, leaving only the wealthy, international business traveller as customers. Global service provided only to a niche market is unlikely to succeed.³⁰

The message of these comments is clear: the Commission must abandon the BAS and FS relocation plan as currently proposed in order to fulfill its vision for 2 GHz MSS of "creat[ing] opportunities to provide the public, especially rural Americans, with access to new and competitive services and technologies; stimulate economic development; and, create new high technology jobs in the United States." NPRM, ¶ 1. Alternatives to migration must be found, and a Federal Advisory Committee is the best forum for such discussions.³¹

³⁰ COMSAT Comments, at 14.

³¹ COMSAT has proposed a two-phase transition plan for the proposed allocation from BAS and FS to MSS. See COMSAT Comments, at 17-24. This plan involves sharing between MSS and FS in the 2165-2200 MHz band and retuning BAS equipment so as not to require replacement of the 35 MHz lost by reallocation of the 1990-2025 MHz band. LQP has participated in meetings among

C. If a Relocation Plan Is Adopted for BAS and FS Stations,
a Federal Advisory Committee Would Be Needed to
Develop Principles for Cost Sharing and Apportionment.

The comments also confirmed the complexity of any plan for reimbursement of transition costs by 2 GHz MSS licensees. In its initial comments, LQP pointed out that the Commission's proposed reimbursement plan raised complex issues such as identifying the parties which benefited from migration of a specific station, imposing costs upon foreign users of the 2 GHz MSS spectrum in the United

BAS, FS and MSS interests to discuss implementation of this or a similar plan.

LQP commends the efforts which COMSAT has advanced to demonstrate the feasibility of its proposal. However, in an effort to achieve some form of compromise plan, these ad hoc discussions have taken on issues outside the scope of the 2 GHz rulemaking. LQP submits that these discussions should be formalized by the Commission through convening a Federal Advisory Committee. Without a charter outlining specific goals for rules to be considered, there is no incentive for all the parties to agree, nor for the parties to discuss all possible alternatives available for the 2 GHz transition. In contrast to these ad hoc discussions, if an advisory committee reaches consensus, then the Commission has some assurance that all views have been aired, and all interests are reasonably satisfied with the resulting proposals. Even if the committee were not to reach consensus, past experience has demonstrated that the Commission receives substantial useful information and policy recommendations which can be integrated into a formal proposal.

Moreover, any compromise based on resolution of private interests in the United States is not likely to address and resolve concerns which would be raised in the international telecommunications community. Since the Commission is pursuing both a domestic and international allocation for MSS at 2 GHz, it would be a worthwhile investment of time and energy to develop a transition plan which could be accepted globally. Through an advisory committee, documentation can be produced for why the recommended alternative is the best from both technical and policy perspectives.

States, and timing relocation so as not to disrupt firm launch schedules and milestone requirements.³²

Other parties amplified these concerns. For example, TRW pointed out that there may be second round applicants for 2 GHz MSS licenses who would benefit from relocation of BAS and FS and should be required to share in the costs of relocation.³³ PCSAT noted that any reimbursement plan would have to take into account issues which would be unknown at the time the plan was adopted, including, for example, MSS licensees which abandon construction plans, and international coordination procedures which would reduce the available spectrum.³⁴

These comments reaffirm the infeasibility of the Commission's proposed use of the PCS reimbursement plan for 2 GHz MSS as demonstrated in LQP's initial comments.³⁵ However, it may be that some form of reimbursement plan will eventually be needed for a transition plan. Given the complexity of the issues and the need to satisfy at least three distinct sets of interests, the Commission should convene a Federal Advisory Committee to gather information and make a recommendation as to the most equitable reimbursement procedure for all parties.

³² See LQP Comments, at 16-20.

³³ TRW Comments, at 13-14.

³⁴ PCSAT Comments, at 9-10.

³⁵ FS parties such as the American Association of Railroads and UTC both recommended use of the PCS procedures. However, neither discussed the complexities of the issues surrounding the use of such procedures for 2 GHz MSS.

IV. THE COMMENTS PROVIDE NO JUSTIFICATION FOR ADOPTING SERVICE AND TECHNICAL RULES FOR 2 GHZ MSS AT THIS TIME.

In the NPRM, the Commission requested comment on certain technical and service rules to govern MSS operations at 2 GHz. A variety of recommendations was offered on these issues. However, no commenter presented a sufficient justification for deciding these issues prior to the adoption of a specific allocation and review of these issues in light of actual applications.

A. Geostationary vs. Non-Geostationary Orbit

Not surprisingly, proponents of geostationary satellites recommended that the Commission adopt a rule permitting geostationary satellites in the new allocation³⁶ while proponents of non-geostationary satellites recommended adoption of a rule requiring low-earth orbit.³⁷ TRW, Ericsson and LQP agreed that the most sensible approach at this time is not to adopt any restriction on orbital height for the allocation itself.³⁸

The Commission should not attempt to dictate orbital height for 2 GHz MSS at this time. As with the allocation for MSS Above 1 GHz,³⁹ the allocation for 2

³⁶ See CELSAT Comments, at 11; PCSAT Comments, at 4-5; Newcomb Comments, at 2.

³⁷ See Motorola Comments, at 11-12; Teledesic Comments, at 8.

³⁸ See LQP Comments, at 21; TRW Comments, at 25; Ericsson Comments, at 2-3.

³⁹ See Memorandum Opinion and Order in ET Docket No. 92-28, 77 RR 2d 556, 558 (1995).

GHz MSS should be neutral with respect to orbital height. However, LQP agrees with those commenters which recommended adoption of a policy of licensing global MSS systems in bands allocated on an international basis for MSS and licensing regional MSS systems in bands allocated for MSS on a regional basis only.⁴⁰

Assigning frequencies allocated to MSS internationally to global MSS systems would promote efficient use of scarce spectrum resources. Moreover, no prejudice is suffered by a regional, geostationary system under such a policy. As Newcomb points out, GSO systems can provide "global" services even though each satellite in the system uses a different set of frequencies.⁴¹ Therefore, it is not necessary to assign such systems to bands allocated for MSS on an international basis. This important distinction should be taken into account in the Commission's satellite licensing policies.

Teledesic proposed that the Commission use this proceeding to abandon the MSS vs. FSS distinction in favor of allocations based on GSO vs. non-GSO systems.⁴² LQP agrees in principle with this recommendation. However, this proceeding is not the appropriate forum for such a policy issue. Revising the Commission's framework for licensing satellite systems involves more issues and parties than those affected by the MSS allocation proceeding, and so, this

⁴⁰ See Motorola Comments, at 11-12.

⁴¹ Newcomb Comments, at 6.

⁴² Teledesic Comments, at 6-7.

proceeding should not be used as a vehicle for that policy change.⁴³ Moreover, Teledesic's proposal should be considered on an international basis before the Commission revises its entire satellite regulatory framework. Accordingly, consideration of Teledesic's comments should be deferred until an appropriate rulemaking is initiated to consider this important policy issue.

B. Access Technology

Comments were also mixed on a requirement for use of CDMA or TDMA by 2 GHz MSS systems. While several parties recommended the adoption of CDMA only for 2 GHz MSS,⁴⁴ Motorola inexplicably criticized CDMA because of the benefit to be gained by the increase in available capacity if multiple CDMA systems operate co-frequency.⁴⁵ As Motorola noted, although each of multiple systems suffers a capacity decrease from solo operation, there is an overall capacity increase through operation of multiple systems.⁴⁶ Even if two co-

⁴³ A rulemaking such as the Commission's proceeding on domestic and international satellite licensing policies would provide a better forum for Teledesic's recommendation. See Notice of Proposed Rule Making in IB Docket No. 95-41 (released Apr. 25, 1995).

⁴⁴ CELSAT Comments, at 11-13; TRW Comments, at 24.

⁴⁵ Motorola Comments, at 12-14.

⁴⁶ Because of the incremental decrease in capacity for each sharing system, there would always be an optimal number of co-frequency CDMA systems to ensure economical operation of all, based on the available bandwidth and any power limits. However, this number would be greater than the maximum number of TDMA systems (i.e., 1) which could operate in the same spectrum without band segmentation.

frequency CDMA systems suffer a 25% reduction in capacity because a third commences co-frequency operation, there would still be a net increase of more than double ($[100 - 25] \times 3 = 225$) channel capacity available to the public. See Gilhousen Declaration, at 1 (attached). Motorola would apparently prefer that the public have access to fewer channels so that a monopoly system can have a few more to sell.

Studies similar to that submitted by Motorola have been trotted out and rebutted in the past.⁴⁷ Chief among the study's faults is its failure to calculate performance using satellite diversity. The authors claim that shadowed users will increase power so as to achieve the nominal signal to noise ratio at one satellite, resulting in increased interference to other systems' spacecraft. The authors thus mistakenly assume that only a single satellite provides useful signals from each mobile to the gateway. But, for example, the GLOBALSTAR system (unlike Motorola's Iridium) uses signals from all available satellites in view resulting in a high order of diversity. If an additional CDMA system were deployed, the capacity of the uplink will actually increase proportionally to the number of satellites because the additional satellites will relay signals of all users equally well and can be combined to increase capacity. See Gilhousen Declaration, at 1-2.

In any event, it is difficult to see what advantage TDMA offers. TDMA requires band segmentation and monopoly access to each segment. Thus, the

⁴⁷ See Documents IWG1-71, 72 and 76 submitted to Informal Working Group 1 of the MSS Above 1 GHz Negotiated Rulemaking Committee.

benefits of diversity are lost as is the increase in capacity resulting from CDMA sharing. This certainly does not demonstrate that TDMA is a better choice.

The record before the Commission on the use of CDMA vs. TDMA for MSS systems clearly demonstrates the superiority of CDMA in terms of achieving multiple entry, maximum capacity and spectrum efficiency. However, the optimum mix of licensed systems should be considered in the context of actual proposals for MSS systems rather than MSS allocations. The processing of MSS applications, not this rulemaking, is the proper time to evaluate the technical advantages and disadvantages of various systems.⁴⁸

C. Geographic Coverage

While some parties recommended a geographic coverage requirement for 2 GHz MSS,⁴⁹ LQP recommends that the Commission defer consideration of this issue. The coverage issue is linked to system design, and system design is linked to availability of spectrum. Until the Commission has determined the allocation for MSS, there should be no geographic coverage requirement for applicants, except that "global" MSS frequencies should be reserved for licensing "global" MSS systems.

⁴⁸ See Ericsson Comments, at 2-3 (recommending adoption of technology neutral allocation).

⁴⁹ See COMSAT Comments, at 33-34; TRW Comments, at 25.

D. Power Limits

COMSAT suggested that no EIRP limit is required in the MSS uplink band because the frequencies are not shared with aeronautical radio-navigation systems.⁵⁰ However, an areal EIRP limit would be required for MSS systems which are operating co-frequency, co-coverage. Thus, for example, an areal EIRP limit would be required to implement CDMA intersystem coordination.⁵¹ Although LQP believes that the issue could be deferred, were the Commission to consider adoption of a PFD limit for 2 GHz MSS downlinks, LQP agrees with TRW's recommended PFD limit at the Earth's surface of -137 dB(W/m²/4 kHz) per space station.⁵²

E. Feeder Links

Teledesic recommended that the Commission adopt feeder link frequencies associated with 2 GHz user link frequencies.⁵³ However, the choice of feeder links raises system design issues which the Commission prefers to leave to applicants.⁵⁴

⁵⁰ COMSAT Comments, at 35.

⁵¹ This approach was adopted as a Recommendation by ITU-R Study Group 8 on June 15, 1995. See ITU-R Document 8/43-E: "Technical Considerations for the Coordination between MSS Networks Utilizing Code Division Multiple Access (CDMA) and Other Spread Spectrum Techniques in the 1-3 GHz Band."

⁵² TRW Comments, at 26.

⁵³ Teledesic Comments, at 9.

⁵⁴ See Notice of Proposed Rule Making in CC Docket No. 92-166, 9 FCC Rcd 1094, 1100-01 (1994).